

## **METHOD OF DISTANCE LEARNING**

### **FIELD OF THE INVENTION**

The present invention relates generally, to a method of distance learning. More particularly, the present invention relates to a method of distance learning comprising the steps of: installation on at least one education center server of a software for database management, data transfer and communication amongst the education system users; student registration in the scope of which they receive at least one electronic data carrier containing educational material for the subject studied in a given format; establishing at least one interactive on-line session between a lecturer and the students, during which session the lecturer presents educational material to the students' interface, in particular by means of activating the material contained in the students' electronic data carriers, and asks the students questions and/or transfers tests and/or exercises to solve, wherein the students' interface is comprised of windows and tools, including those of remote communication, such as electronic mail, voice mail, chat and forums; and finishing the on-line session within a predetermined period of time.

### **BACKGROUND OF THE INVENTION**

Economic changes and technologic progress of any country results in the necessity to acquire, in accordance with current needs, new abilities, usually obtained by university studies. Traditional education requires students to travel to an education center, often distant from their homes, frequent commuting and organizing of time for participation in daytime, evening or week-end classes, can significantly increase the cost of study for some and limit the time available to study for others. As a result, many segments of the population, desirous to improve their qualifications, particularly those working, raising children, physically handicapped or with limited financial means have little opportunity to follow a traditionally conducted education.

The progress and development of informatics has provided unlimited possibilities of application for distance education, resolving the above problems, and making education available for a considerably larger segment of the

population. New computer technologies provide quick access to extensive data sources and databases (Internet), new communication means (e-mail, chat, voice mail, videoconferencing) and work tools, including better and constantly improved software and hardware.

These advantageous properties offered by new technologies have resulted in the very fast development of new remote learning methods and an enormous increase the growth of the number of on-line students. In tracing the requirements for distance education using technology, a number of systems and methods for teaching, utilizing electronic means of data processing, transfer and communication, have been proposed.

U.S. Patent Application No. US 2001/051330 A1 by Futakuchi, describes an apparatus and a method for providing remote teaching. The apparatus is comprised of a question database, an answer database and a comment database as well as a control unit, connected via the Internet to the students' personal computers. The system determines, whether the answer to a given question is right and generates an appropriate comment.

U.S. Patent Application No US 2002/0018984 by Ho et al. relates to a method and a system of learning based on questions and answers. After working on the study materials presented by the system, the user introduces a question into the system, which generates and presents an answer. Then the system compares the questions with those previously entered, to determine his level of understanding of the subject and to select appropriate study materials.

U. S. Patent No. US 6,139,330 to Ho et al. describes a computer-aided learning method and system based on tests. The system is provided with a recommendation generator which may have a form of a software, hardware or some combination of both. The generator is configured to assess user's understanding of the subject.

U. S. Patent Application No. US 2001/0039002 to Delehanty, describes a system and a method for implementing and managing training programs over a network of computers. The system comprises computers of the server-client type, while the server contains a user database, an actionable database and reference database. The system and method enable training by means of the Internet and a web browser. When a user follows the training, the system monitors the student's

results and enables the web administrator to determine in real time the student's progress and add additional materials of study if a need for supplementary education is perceived. During the training, the administrator may communicate with the user directly.

U.S. Patent No. US 6,164,974 by Carlile et al. relates to a learning system to be used by authors, teachers, students and education administrators. Within this system, a student, while studying a displayed subject matter, may check the degree of their knowledge using tests that are provided and the results of those tests are displayed together with an assessment of the student's knowledge of the subject matter.

U.S. Patent No. US 6,326,632 by Chao et al. relates to a computer-aided learning method, allowing a student to select an appropriate instructor for learning a language and vice versa. After the student's choice of instructor has been made, establishing a connection between them occurs and then automatic management and payment collection for the session.

U.S. Patent No. US 6,341,960 to Frasson et al. describes a method of providing a learner with information, during a session of automatic distance learning using the Internet. The method comprises an automatic selection of learning strategy, determination of a need to use help data, being a separate part of educative information, and their selective presentation. When using a model of an automatic learner, possible difficulties are revealed, then, on this basis, explanations from a local database or the web are provided.

PCT/IT01/00336 (WO 02/09065) by Valenti relates to a computer-implemented didactic method, which is comprised of the following steps: a user connecting to a central management system; downloading from the central management system the program-environment to their computer (if not already available); checking the student's registration in the system (if there is none, it is started); the user obtaining data files containing educational material for subjects to be studied and possible extension programs; creating for each user a personal download area; disconnecting the user from the system; and activation of the data files for realizing a training session.

U.S. Patents Nos. US 6,336,813 by Siefert and US 6,386,883 by Siefert and U.S. Patent Application No. US 2001/0018178 by Siefert describe a computer-

assisted education method, in which individual learning profiles for every student are maintained, including their capabilities, preferred learning style, and progress. Based on the student's profile, the system's administrator selects an appropriate material for each student, during each learning session. Then the administrator assesses if the student has mastered the material. If not, a presentation of the material explained differently follows and in the case of a student continuing to fail to master the material, the administrator establishes a videoconference between the student and a lecturer. Learning programs and education material are contained in master computers, accessible via a communication network. The invention is applicable for known education programs and known management systems.

Computer-based, interactive learning method and system, permitting application of various teaching techniques, adapted to individual abilities and needs of the students is disclosed in PCT/US00/32960 (WO 01/43107) to Koneru et al. The system includes students' computers, teachers' computers and a remote server, containing several databases consisting of exams, tests and vocabulary, detailed student information and their individual learning schedule and teaching profile, as well as information of the teachers, interconnected by a web. For each student is created an individual homepage with a graphic interface, containing among other things questions, tests, exams, study subjects and helpful tools. Electronic mail, fax and voicemail remain at a disposal of the system's users.

UK Patent No. 2 368 710 to Dugdale et al. discloses computer-readable CD-ROM disc media, containing data grouped in sections and at least one URL address for communication with an active server page, which contains a database of external links corresponding to specific keywords within a given section.

U.S. Patent No. US 6,190,178 relates to a remote education method and apparatus. Students connect via the Internet with an education server, which contains an educational program, including individual progress data for each student. The remote education method is comprised of a student selecting required learning procedures in an Internet homepage of the education server, consequently finding data related to the procedure selected and then creating an educational homepage, with the assistance of which the student implements his

study. Upon completion of the study, the student answers tests, which are then analyzed by the server and upon analysis of the results a direction for continuing study is indicated.

PCT/US01/42230 (WO 02/25619) by Crilly describes a method of adaptation of educational standards in different states and regions, comprising the steps of providing each class with a computer and DVD disks containing educational aids in the form of video and audio, connecting the computer with a World Wide Web, from which are taken additional educational aids, lesson plans and projects, being relevant to the particular operating location, and presenting the educational material, together with that contained in DVD disk, to the students in a classroom.

U.S. Patent US 6,195,528 by Young et al. describe a remote teaching method and system. Each student is provided with a CD-ROM disk, containing an educational material in various formats and a software, with the aid of which, the student's computer may connect with a central computer to download appropriate data, particularly those updated in relation to the data contained in the student's CD-ROM disk.

Interactive method for distance education using a computer network is disclosed in U.S. Patent No. US 6,381,444 to Aggarwal et al. The method comprises the steps of student registration to a chosen virtual class on a main server, downloading from this server of an educational material by an instructor and sending it before starting the lesson to all students of a given class. After start of the lesson, the instructor controls, on the server level, the students' computers where the educational material is presented. The student interface contains windows, where various information is displayed, including the material presented, video pictures, e.g. that of a real classroom, as well as students' questions to the instructor and his answers.

U.S. Patent No. US 6,155,840 by Sallette relates to a system and method for distributed learning by means of computer systems and a communication network such as Internet. The system includes a server with which are connected a presenter, presenting an educational material, and the users' computers, coupled to the server via Internet. The presenter's interface includes a few windows and tools intended to configure the presentation. Individual windows are provided for a list of information sources for the presentation, like films, homepages or slides,

for an information about material presented and about the presenter, a window for communication with students, e.g. by means of chat, as well as two windows for presenting two streams of educational material of which one serves for video-presentation. Users' interfaces include similar windows.

Another method of on-line education in the frame of an open virtual university is disclosed in PCT/US01/40102 (WO 01/61670) to Wheeler. The educational system is created by various universities and schools, sponsors, students and an interconnected intermediary, being for instance a virtual medical school, an Internet provider or a governmental agency. A program of the studies includes lectures on various subjects, which are presented to the students by several institutions by means of the intermediary and the Internet. Sponsors, for instance a pharmaceutical firm or a health organization, cover at least partially the costs of the system's implementation, which reduces the students' education costs. Studies maybe divided in two stages, of which one includes the on-line education and the second stage is conducted on campus upon satisfying completion of the first stage.

Yet another system and method of on-line education is disclosed in PCT/US00/17979 (WO 01/01372) to Alcorn. The system includes a server, connecting students' and instructors' computers via a network. The server contains course files, accessible for registered users in accordance with their authorized access level. Course files include announcement and information files, documents, exercise files and communication files. On-line education comprises the steps of generating by the course instructor of a set of course files, transferring the files to a server for storage, and making access to the files to a group of students being registered for that particular course. During the course, the instructor selects, from a batch of available files, appropriate exercise files or creates such files and adds them to those existing, and transfers these to the students for resolving. Upon resolution of the exercises, the students create answer files, transfer them to the instructor which evaluates them and presents to the students a list of ratings. The instructor has at his disposal several tools, such as those for creating the course, for the presentation of educational material in an appropriate format, a list of Internet links, chat, electronic mail and similar tools, permitting him to conduct the course by various techniques.

UK Patent No. GB 2 334 119 A by Young et al. refers to a teaching method and system, in which are used CD-ROM-s with educational material and software for managing educational material, communicating with another computer to obtain access to other parts of the educational material as well as for downloading material updates and tests.

The systems and methods of remote education, described above most often relate to a fully automated teaching to obtain or improve a knowledge upon a given subject, hence to a fragmentary education. They are adapted to a fast and easy means of gaining knowledge, with the assistance of computers and communication networks, with lack or considerable limitation for the participation of highly qualified persons, e.g. a university lecturer. Although a majority of known remote education systems and methods have several advantages, it is not possible to apply them directly for teaching students in accordance with high level traditional education programs. For this purpose it is necessary to develop a coherent education system including the whole program of the studies, which should be the same as in the case of traditional studies and should ensure a high level of education, with frequent contacts between the students and the lecturers. Thanks to this, it will be possible for the students to gain the same knowledge and qualifications as in traditional studies.

### **SUMMARY OF THE INVENTION**

In accordance with the invention there is provided a method of distance learning, the method comprising the steps of:

- a) dividing the education program into several education levels, of which each one including at least one module, corresponds in its contents to a subject of a traditional education;
- b) providing each student, within the registration, with at least one electronic data carrier including workshop material and a multi-media electronic textbook for independent study, and with an access password to the educational platform;
- c) establishing at least one interactive on-line session of electronic workshops for each module within each education level in a predetermined time after registration of the students, at least one interactive session being established through the educational platform containing a web site, and at least one

interactive session including a presentation to the students by the lecturer of the workshop material, submitting to them questions and exercises to resolve, checking and discussion of the exercises' solutions by the lecturer and a group discussion among students, with use of remote communication means;

d) activating electronic consultations between the students and the lecturers, following the termination of each interactive session of the electronic workshops, with use of remote communication means;

e) providing each student, following the termination of a predetermined session, preferably the first session of the electronic workshops, with a subject of a test work for individual preparation and to be submitted using a test work report to the university at a predetermined time; and

f) conducting a final examination for each module.

In a preferred embodiment, each educational level includes at least several modules. For each module are organized several, preferably between 5 and 10, interactive sessions of the electronic workshops, of which each has a duration between 1 and 5 hours, preferably between 2 and 3 hours.

Preferably, the workshop material, being activated during the interactive electronic workshops, consists of a series of following sequences: presentation of problems, description, explanation, illustration, actual example from an economic reality, indication of application possibilities, checking of the students' understanding of the material and finally a recommendation for individual application.

In a most preferred embodiment of the invention, the method further comprises the step of dividing each session of the electronic workshops into several independent parts with the same or different duration, wherein in the first part a presentation to the students of the workshop material, a discussion of the issues by the lecturer, as well as students' replies to the lecturer's questions take place; in the second part – transmitting by the lecturer of exercises for individual resolution and their resolving by the students; in the third part – checking of the exercise solutions by the lecturer and a discussion between the students by means of remote communication means; in the fourth part – summing-up of the issues and exercise solutions by the lecturer; and in the fifth part – a discussion between the students by means of remote communication.



Advantageously, the method further comprises the step of directing the students, who do not manage to login to the educational platform before the start of the electronic workshops, first into a "waiting room" and then automatically including them into the participation in the electronic workshops, preferably prior the commencement of a next part the workshops. The "waiting room" for students is advantageously created by parallel, shifted in time, running of a few identical electronic workshops, advantageously during the first part of the workshops.

During the presentation of successive issues by the lecturer, the students are preferably provided with a list for saving Internet addresses relating to the issue discussed, to which new addresses are then attached to the list relating to consecutive issues.

Advantageously, for a discussion are utilized remote communication means in form of at least one tool selected from a group consisting of: electronic mail, voice mail, discussion group, chat and forum.

In a preferred implementation of the invention, the electronic consultations are conducted by means of the educational platform, with use of the e-mail and discussion group that consist of the students of a given module, and with participation of an operator/consultant and/or the university's lecturers. Upon receipt of a question by an operator/consultant within the electronic consultations, a check is first made in a "knowledge database" and if it does contain an answer to the question asked, the operator/consultant transmits it to the student, while in the case of a lack of such an answer, the question is directed to a lecturer running a given module, which transmits the answer to the operator/consultant and the latter to the student. The answer to a question asked is advantageously added to the knowledge database. Preferably, a lecturer is the operator/consultant of the electronic consultations.

Preferably, the method further comprises the step of activating interactive archives of electronic workshops, the archive of workshops being activated after the termination of the electronic workshops, but prior to returning the test work report, preferably solely to the scope of the first part of the electronic workshops.

In a most preferred embodiment of the invention, the method further comprises a step of activating interactive electronic reviews, the reviews being activated prior to the final examination for each module, with a participation of the

lecturer. The reviews comprise, among other things, a review of the material covered within the electronic workshops and a group discussion, with use of remote communication means.

The electronic reviews are conducted most advantageously similarly to the electronic workshops.

In a particularly preferred embodiment of the invention, the method further comprises the step of creating, prior to commencing the examination, a dynamic examination list, which is blocked in a predetermined time before the start of the examination. The examination is conducted by a traditional means or by an electronic means.

It is preferred that all the information, terms and possibly duration of individual components of the educational process, i.e. the interactive electronic workshops, the archived workshops, the test works, the electronic reviews and the examination, as well as control work subjects and results, and the exam grading, preferably together with general remarks and descriptions, are included in the web site of the educational platform, which is accessible through the use of the access password and the student's identification number.

In a preferred embodiment, the method further comprises the step of creating a dynamic electronic library in the web site of the educational platform, the library being accessible through the use of the access password and the student's identification number.

If desired, the method further comprises the step of checking, prior to the commencement of an electronic workshop session, of a computer's equipment and software, necessary for the communication with the educational platform and being in the possession of the students. The checking being made by means of test software included in the educational platform's web site. In the case of finding by the test software of a deficiency of necessary software, an automatic installation of such software through the educational platform's web site follows.

In a particularly preferred embodiment of the invention, the workshop material and the multi-media electronic textbook provided to the students are included in a single CD-ROM disk.

In the frame of registration, the students are preferably provided for each module with a syllabus contained in an electronic data carrier, preferably in the

CD-ROM disk including the workshop material and the multi-media textbook. In this CD-ROM disk is also placed a starter package, including in particular a didactic guide and a technical instruction as well as a software necessary to open the formats of the files contained in the workshop material and the electronic textbook.

During the interactive electronic workshops and the electronic reviews for the students is displayed an interface, including at least two, preferably three main windows: an information window, an action window and a dialogue window, respectively, and tool bars.

In a preferred embodiment of the invention, in the information window is presented all complementary information relating to the material discussed, in the action window is presented an educational material concerning the issues discussed by the lecturer, and in the dialogue window are displayed in particular the syllabus, an index of key notions, definitions and formulas, a calculator, the electronic textbook as well as the chat and the e-mail.

It is preferred, that in the action window are presented videos, 3-D animations, 2-D illustrations, layouts, diagrams, texts, calculations and other dynamic information. The videos in the action window may include at least one presentation selected from the group consisting of: video with a lecturer or other individual discussing an issue, recorded earlier or taken by a camera in real-time, video with an example illustrating an issue, interviews, documentary films as well as video showing utilization of computer programs, in particular of calculation sheets and databases.

Toolbars in the interface comprise advantageously communication buttons, including those for the chat, the e-mail and the forum, and recall buttons, including recalls to the electronic textbook, to the glossary of terms, the syllabus, Internet addresses and to the calculator. Preferably, in various phases of the electronic workshops individual communication and recall buttons are enabled or disabled.

The system of distance education according to the invention is elastic and fully synchronized with a traditional education, since it enables the individual to shape and select a suitable mode of study, with an implementation of certain educational stages by an electronic or traditional means.

The system enables studying to individuals from any region within and outside the country, without a requirement of frequent travel to the university which has an extreme importance for handicapped persons, for persons having extensive professional or family obligations and for the impoverished. The system of education according to the invention has a considerable social importance, since it offers the opportunity to obtain an education to a much larger group of persons than in the case of traditional education.

Organization, coherence and absolute modularity of the education system ensure high standards of teaching on various study levels. Within the system are applied available remote communication means, several ways of knowledge transfer, adapted to individual needs of the students as well as direct or virtual contact with a lecturer, which makes of the education according to the invention, an active one.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

In order to understand the invention and to see how it may be carried out in practice, a preferred embodiment will now be described, by way of a non-limiting example only, with reference to the accompanying drawings, in which:

**Fig. 1** illustrates a block diagram of the distance learning system;

**Fig. 2** shows a block diagram of modular distance learning method;

**Fig. 3** presents a block diagram illustrating the modular distance learning method within a single module;

**Fig. 4** shows a list of equipment received by a student during the registration for the studies,

**Fig. 5** shows a block diagram of the electronic workshop architecture;

**Fig. 6** illustrates a concept of "waiting room" for students waiting for the electronic workshops;

**Fig. 7** illustrates a representative user interface during an interactive education according to the invention; and

**Fig. 8** shows a scheme of electronic consultations implemented within the method of distance learning.

### **DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS**

The system of distance education, according to the invention, covering both the learning method as an apparatus for its implementation is intended particularly for education of the university students with possibility of selecting various programs, such as for example Business Management, Business Information Management, Finance Administration, Business Finance and Information Systems, Advertising and Marketing, Enterprise and Management or any other program, depending on the university's profile. These may be both full academic programs and short education forms (after diploma studies, education/courses). Although the invention is described below in relation to universities, it will be understood for those ordinary skills in the art that the method of the present invention can be carried out for any schools, training and development centers on various levels.

The studies take place at a distance with utilization of electronic data processing and transfer as well as of remote communication means. General block diagram of the education system is shown in the Fig.1. Each student 1 is provided with a computer, not shown in the drawing, such as for example a PC unit including an appropriate processor (such as Pentium II) a drive for disks, such as CD-ROM and/or DVD and/or floppy disks, an adequate RAM memory (e.g. 64 MB), graphic and sound cards, a modem or a net card (enabling a data transfer at minimum 5 kbyte/s speed) as well as standard peripheries, such as a monitor, a keyboard, a mouse, earphones/loudspeakers and possibly a printer. The computer should have an appropriate operating system, advantageously of a Windows or a Linux type and other basic software such as a text editor, a calculation sheet and a video player.

The computer of each student 1 may be connected via a communication network 2, such as Internet, to the educational platform 3 implemented in at least one local net (LAN) of the university's education center, directly accessible for lecturers 4. If the university has several divisions, then the educational platform 3 may be implemented in all equivalent sub-nets of the divisions, which will reduce the sub-nets load and decrease the system's mortality.

As used herein, the term "student" is intended to mean any person studying at any university, including technical ones, at any school, training or vocational development center. As used herein, the term "lecturer" is intended to mean any

individual conducting lessons with students, for example a professor, an assistant lecturer, a teacher or an instructor.

The educational platform 3, which is called "e-edusystems", consists of a software, destined for conducting on-line lessons, utilizing a transmission of data in any format for communication among the system's users and to gain access to various educational resources of the school.

The learning system according to the invention is destined for a distance education of students in a mode called "e-learning" and enables performing studies on various levels, similarly as in the case of traditional full-time or evening studies. A scheme of multilevel studies is illustrated in the Fig. 2. The studies may be finished partially with a diploma for completing first and second study levels (Level\_1 and Level\_2, respectively) as well as for a Bachelor of Arts (BA) degree (Level\_3) after accomplishing all the modules (subjects) on all three study levels (undergraduate studies). Upon completing Level\_4 and Level\_5 (so called postgraduate studies) the student achieves a Master of Arts, Master of Sciences or Master of Business Administration diploma. The number of education levels 10, 11, 12, 13 and 14 is not limited to five and may be smaller or greater, depending on the specifics of the school and study profile.

The learning method according to the invention is based totally upon a modular system of education. Each level 10, 11, 12, 13, 14 of the studies includes several, for example eight educational modules  $M_1, M_2, \dots, M_n$ , every one of which is an analogy to one traditional subject in its program and contents. The program of educational modules  $M_1, M_2, \dots, M_n$  ensures obtaining the same knowledge as during traditional full-time studies, thanks to which all the students, whether studying in full-time, evening or distance mode, are entering together the same examination and obtain the same diplomas. All the students are also obliged to complete a diploma seminar and to defend a thesis.

Selection of modules for a study, during a given session, depends to a large extent on the student, his time, financial and intellectual capabilities. A student has to select for one session at least one module. Generally, the number of modules studied may be discretionary but a number higher than two or three is not recommended. More modules studied during one session permit an earlier completion of the studies, but may hinder the student's assimilation of the

knowledge. Also the sequential order of modules studied is relatively unrestricted. Limitations relate solely to those modules, which may be selected only after completing an earlier one. This way, each student may, on their own, considerably modify his learning process, depending on various circumstances.

An academic year of the studies according to the invention has a duration of 10 (or 12) months, starting 4 (or 5) times a year (depending on student's choice) that is, for example on the 1 of September, 1 of November, 1 of February and 1 of April (or also on the 1 of July). The academic year consists of a few (4 or 5) two-month sessions of seminars-workshops, during which a selected module (or modules) is implemented, according to a chosen schedule and of two (or more) monthly examination sessions (for example in January and June).

Activity schedules for individual modules are placed in the university's web site, and students have a choice from a few terms for the activities to make a selection according to their professional, time or other preferences.

An important feature of the present invention is in its total synchronization with a traditional education system, and individual steps of the method may be implemented as well by fully electronic means, as by partly traditional, for example during the registration, submitting the control work or participation in the consultations. All the students, regardless of the selected mode of studies, are subject to the same crediting and examination requirements. The exams take place in the same time at a determined place and each student has to participate in them personally. Fig.3 represents a method of distance learning according to the invention within one exemplary module **M**. Identically occurs studying of other modules: **M<sub>1</sub>**, **M<sub>2</sub>**,...**M<sub>n</sub>**, both within the given and the other educational levels **10**, **11**, **12**, **13**, **14**.

To initiate studies by the method according to the invention, an applicant has, in the first order, to make a registration. The registration **20** (Fig.4) includes submitting to an appropriate department of the university – similarly as in the traditional education mode – suitable documents **30**, as for example an application letter, an original and a copy of a high school certificate, photographs, proof of payment for the module and other documents, as required by the university. The payment for the module and the submitting of an application may be effected in any way, including the electronic one. During the registration a

candidate for studies selects a faculty and at least one study module. All the information concerning faculties and activity terms are available on the university's web site, being an integral part of the educational platform 3. In the web site is included information on lecturers, conducting a given module, their e-mail addresses, information on consultations, discussion group addresses and other necessary information.

Within the registration 20 a student receives a syllabus 31, a workshop material to be activated during the interactive electronic workshops, a multi-media electronic textbook, a starter package 34 and an access password 35 for the educational platform 3. The syllabus 31 contains information relating to the material the student should prepare before given workshop activities, to better understand the material presented during the interactive electronic workshops 21, as well as information on complementary literature. The syllabus 31 is preferably contained in an electronic data carrier, such as for example a CD-ROM or DVD disk and/or placed in the university's web site.

Workshop material 32 being activated during the interactive electronic workshops 21, consists of a series of following sequences: presentation of the problem, description, explanation, illustration, actual examples from economic reality, indication of application possibilities, checking of student's understanding of the material and finally a recommendation for applications. Besides, the workshop material 32 presented acts upon several senses (eyesight, hearing) and various perception forms (for example presentation of text, static and moving pictures). Application of such solutions, advantageously visual (for example graphic animation, visualization of a run of thoughts), which will facilitate the student's understanding of successive issues, is also of importance. In the workshop material contained in a CD-ROM or DVD disk is preferably included a majority of the educational material being presented during the electronic workshops 21, and activated by the lecturer, in particular the high-volume educational material. Due to the above, high data transmission speed is not required, since during the workshops only a low-volume part of the educational material is transmitted and attached to the high-volume educational material. Should a high-speed data transmission network exist, it is, of course, possible to transmit a larger part or totality of the workshop material.



Multi-media electronic textbook **33** is a substitute of a traditional textbook or reference textbook, therefore it contains a material relating to the issues of a given subject (module). It is intended for student's study, giving a possibility of mastering the material within an independent effort. Basing upon the material included in the multi-media textbook **33** and recommended complementary literature, the student, according to the recommendations of the syllabus **31**, prepares for the workshop sessions. The electronic textbook **33** is included in the CD-ROM or DVD disk. The electronic textbook **33** contains data in any format, including text, graphic, audio and video as well as useful Internet addresses for complementary materials. The electronic textbook **33** may be enabled both in off-line as in on-line mode (during the workshop sessions). In the first case, the electronic textbook **33** may be opened by means of an executory program included in the CD-ROM disk at any time, without a necessity of connection to the educational platform **3** through Internet. After opening of the electronic textbook **33** at first a front-page screen is displayed and next a contents list. Upon enabling of any title in the contents list, sub-titles become displayed besides the contents list. Browsing in the textbook is effected using a keyboard and/or a mouse, or using buttons displayed in a toolbar, such as transfer to previous and next page, return to previously open page, transfers to the contents list and to the definition index, which considerably accelerates the educational process. Available are also options of reader enabling and disabling, printing, zooming and other standard program service functions, such as help and product information as well as program closing.

Starter package **34**, included advantageously in a CD-ROM disk, contains a didactic guide and a technical instruction, instruction movie and necessary software for opening formats of files contained in the workshop material **32**. Opening the starter package **34** causes a check-up of required software, already installed, and in case of found deficiency, an automatic installation is effected. The starter package **34** may also include other necessary data or information.

The above described components, i.e. the syllabus **31**, the workshop material **32**, the electronic textbook **33** and the starter package **34** may be contained in separate disks, destined particularly for the individuals studying in other way than the "e-learning". For the "e-learning" students, all of them are preferably included in a single CD-ROM, which considerably facilitates and

simplifies the learning and the operation of the educational material and reduces production costs of large quantities of CD-ROM disks or other electronic data carriers.

Access password **35** serves for the student's login to the educational platform **3** of the educational system during the electronic workshop sessions. The access password **35** remains unchanged during the whole study period for these modules, to which the student registered himself. Depending if the student participates in a given session or not, the access password **35** is active or not, respectively.

Following the registration **20**, a student should start individual learning, utilizing all the materials **31**, **32**, **33**, **34** received as well as Internet with which he may connect using the Internet addresses, in order to obtain complementary material (this relates to the links being an Internet bibliography). For a study of each module, a student should devote sufficient time for individual learning, so called independent study, amounting in regard to the module's difficulty between 100 and 200 hours. Although the distance learning system is very flexible, from a student is nevertheless required orderliness and self-discipline.

Following the registration **20**, but prior to start of the session of electronic workshops **21**, a student has an opportunity to check his computer hardware to obtain information, if it complies with requirements concerning communication with the educational platform **3**. For this purpose serves a specially prepared test software, included in the university's web site, being an integral part of the educational platform **3**. After start-up of the test software, using the access password, a verification of the software and hardware used by the student is effected. Any lack in equipment or software is signaled by a suitable announcement, while, in the latter case, there is a possibility of automatic installation of the missing elements by downloading from the web site.

Next stage of the distance education method according to the invention are the interactive electronic workshops **21** illustrated in fig. 5, taking place completely on-line. In a suitable time, prior to the start of the electronic workshops **21**, counting several or even several dozens of minutes, a student **1** should login to the educational platform **3**, using the access password **35** allocated to him. After the login to the educational platform **3**, each student has an access to a list of

modules **M** to which he is enrolled. To participate in on-line classes the student selects from the list that module in which he intends to participate this time.

Each module **M<sub>1</sub>, M<sub>2</sub>,...M<sub>n</sub>** consists of several electronic workshops **21**, the number of which ranges from a few to several dozens, for example nine, taking place in consecutive weeks or being otherwise spread in the time of a given study session. Duration of one session of the electronic workshops **21** ranges from 1 to 5 hours, for example 2 or 3. During the electronic workshops **21** a CD-ROM disk, containing the workshop material **32** and, preferably, the electronic textbook **33** should be located in the drive of the student's computer, to enable free access to it. The purpose of the electronic workshops **21** is in creating communication between the lecturers and the students, similarly as during classes (lectures, seminars, exercises) in the traditional education.

Each session of the electronic workshops **21** (Fig.5) includes two principal parts: the presentation-workshop part **A1** and the individual students' work parts **B1, B2, B3, B4**. For each of the parts **A1, B1, B2, B3, B4** an appropriate time is allocated, for example, in a two-hour workshop session for the parts **A1, B1, B2, B3, B4** 30, 30, 20, 10 and 30 minutes, respectively, are allocated. The number of parts, into which is divided each session of the electronic workshops **21** as well as the duration of each part may, of course, be suitably changed in accordance to the volume of material in a given module, degree of its advancement and difficulty to assimilate.

If before the start of electronic workshops **21** a student will not manage to login to the educational platform **3**, he/she will be directed to a "waiting room" and automatically included to the workshops at the nearest opportunity, for example after an end of one and before a beginning of another part of the workshops. An example of practical implementation of the "waiting room" (Fig.6) consists of parallel conducting from the university's transmission center of a few, advantageously 2 or 3 similar workshops with a delay of a few, for example 5, minutes between them. If the student's delay is small, not exceeding one transmission delay he/she starts participation in the workshops in the session starting next. If the delay is significant, from the "waiting room" the student is transferred to the next part of the classes. Such a shifted transmission of a few

sessions of the electronic workshop **21** may relate to all their parts but most favorably it should concern the first part **A1**.

In each part **A1**, **B1**, **B2**, **B3**, **B4** of the electronic workshops **21** (Fig.5), both the lecturer and the students have defined tasks to perform. In the part **A1**, the lecturer presents more important issues and problems, which he then discusses and explains, he presents as well more important definitions, illustrations and practical examples. One of the elements of the lecturer's presentation of successive issues is in providing of a list of Internet addresses relating to the problem. During the presentation, to the address list, successive addresses are added, which makes the list grow with the presentation. It can be saved by students for later opening. In the part **A1** the lecturer asks the students short testing questions in a form of tests, which the students answer immediately. These questions have a purpose of running evaluation of the lecture's reception by the students, as well as keeping up their concentration, activeness and interest. The lecturer may in real time review the number of individuals who answer the questions, the rate of correct answers and observe which issues were not correctly understood by the students, or raise doubts and which are too easy for the group. This enables the lecturer to presents, if necessary, the subject in another, more comprehensive way. The students' task in the part **A1** of the electronic workshops **21** is in attentively following the material presented by the lecturer and in answering the test questions asked.

In the part **B1** the lecturer transmits to the students exercises for individual resolving, both obligatory as facultative, in the form of files, containing various types of exercises. These may be problems, analytic and quantitative exercises, text files, calculation sheets or other, depending on the kind of subject and exercise. During the resolving of the exercises, each student may ask the lecturer questions in the form of chat, but cannot communicate with other students (to not disturb their activities), besides that, he/she may use the electronic textbook **33** , enabled from the level of the educational platform **3**. In the end of the part **B1**, the students send the lecturer, by electronic mail, files with resolved exercises, at least those obligatory. Solutions of the facultative problems may be transmitted later, within the electronic consultations described below.

In the part **B2** the lecturer checks the exercise solutions sent to him while the students using chat discuss between them, compare the solutions and exchange views and remarks. In the part **B2** the lecturer does not participate in the chat discussion, although he oversees its course.

In the next part **B3** of the electronic workshops **21**, the lecturer sums up the exercise solutions, discusses the most important problems and sends by electronic mail correct solutions to all the students inscribed for a given module, also to these which did not participate in the workshops.

The last part **B4** of the electronic workshops **21** is intended solely for disposal of the students, which may continue their discussion upon the issues touched within the workshops. In this part of the workshops the lecturer does not participately active, but performs the function of an observer.

During the electronic workshops **21**, of considerable importance is the educational platform's **3** interface **40**, designed specially for educational purposes. The user interface **40** has been so designed, as to be user friendly. It includes three principal windows, i.e. an information window **41** (left window), an action window **42** (right window), and a dialogue window **43** (lower window) as well as upper and lower toolbars **44** and **45**. It should be noted that the given definitions of the positions of windows and toolbars, like left, right, upper and lower are used only to simplify the description, since each of them may be relocated, reduced, enlarged or closed.

The information window **41** serves to present various auxiliary information, like an index of the notions of which definitions are described in the action window **42**, questions, clues for answering given questions as well as mathematical formulas, additional information relating to the examples discussed, text of exercises, definitions and similar information.

In the action window **42** is presented an educational material connected with the issues discussed by the lecturer. Various forms of presentations are utilized without limitations, for example: video, 3-D animations, 2-D illustrations, layouts, charts, texts and calculations, new information and other suitable data. Video in the action window **42** includes a video presentation with a lecturer or other individual discussing an issue, pre-recorded or as a real-time camera take, video film with an illustrating example, interviews (for example with an expert),

documentary films as well as video presenting the use of computer programs (appearance of screen during successive actions), for example of a calculation sheet or a database. Such a differentiated presentation of a material considerably facilitates students' assimilation of a knowledge.

The dialogue window **43** enables fast access to the syllabus **31** of the electronic workshops **21**, to the index of notions, definitions, formulas, calculator, electronic textbook **33** as well as to the chat and electronic mail, and to the virtual campus.

Upper toolbar **44** of the interface **40** includes standard buttons **46** for closing, reducing, and pulling-down, as well function buttons, for example to start and close a session. Lower toolbar **45** includes communication buttons **48**, for example a chat, an e-mail or a forum, where all the educational platform users may exchange views and remarks, as well as relay buttons **49**, including relays to the electronic textbook **33**, notion index, syllabus **31**, Internet addresses and calculator. All the above tools are an integral part of educational platform interface **40**. The tools are active or not, during the electronic workshops **21**, depending which part **A1**, **B1**, **B2**, **B3**, **B4** of the workshops is executed. For example, the relay to the electronic textbook **33** is active in the part **B1** as an aid for exercise resolving and in the parts **B2** and **B4** during the group discussion. The chat button remains active in the parts **B2** and **B4** of the electronic workshops **21**, while the e-mail button in the part **B3**.

Lecturer's interface is similar to the students' interface **40** with that difference, however, that it does include additional windows, presenting for example information on students participating in the given electronic workshops **21**, a number of students which answered a question asked, a number of correct answers and similar information.

For the students which did not participate "live" in the electronic workshops, as well as for those, which would like to repeat the classes, an archive is provided, including only the part **A1** of the electronic workshops **21**, since the correct answers of the exercises have been distributed by e-mail to all the students registered for the module. Participation with archived electronic workshops is similar as in the "live" workshops, via the educational platform **3** and Internet, using the access password **35**. The archived electronic workshop option is active

to the moment of submitting the test work 23 in a given workshop session. The access password 35 to the educational platform 3 remains also active, for each module, for a definite time, for example 2 weeks prior to each examination 25. This allow students to have an access to all electronic workshops having been conducted, in order to repeat the material previously followed.

After completing a session of electronic workshops 21 (Fig.3) the students have a possibility to use the electronic consultations 22 (called "e-consultations"), which may be complemented by traditional consultations, during the lecturer's duty. The e-consultations 22 (shown in the Fig.8) take place during the whole year of studies and are effected by means of e-mail or group discussions, after the student/s login to a mail system, being an integral part of the university's web site, hence of the educational platform 3. The e-mail may operate in any mail system, for example in the Novell GroupWise 6. By means of the electronic consultations 22, students may ask for the assistance of any lecturer in the university, not just of the one with whom they had earlier classes. Within the electronic consultations 22 the students may ask any questions, relating to defining the issues of a given module, while the question should be concise, clear and understandably formulated.

A question posed by a student is answered by an operator/consultant (Fig.8), which in the first order checks if an answer for the question is in the "knowledge database", prepared specially for the needs of "e-consultations" upon the basis of many years' experience gained during traditional consultations, having taken place in the university. Should the "knowledge database" not contain suitable contents to serve as an answer for the question or should the question require a more detailed reply, the operator/consultant communicates with an appointed lecturer in the discipline, responsible for the participation in the "e-consultations", which prepares answers for the questions received and sends those to the operator/consultant. The operator/consultant transmits the answer received to the student and places it in the "knowledge database". The role of the operator/consultant may be, of course, performed by a lecturer.

The student receives the reply from the operator/consultant within a given time, for example within 48 hours, while in very complicated or exceptional cases – after a longer delay, such as for example 72 hours. The electronic consultations

**22** within the discussion groups have for the purpose an exchange of information, questions and resolutions concerning the problems, related to a given module. Access to the discussion group is limited only to those students which are enrolled for the module, while for each module is provided a separate discussion group. The discussion group activity is run under a supervision of a lecturer of the given module, his obligations include answering questions, particularly those, which remain without a reply by fellow students for a considerable time or are asked most often, as well as to give hints as to the correct way of resolving the exercises, to incite polemics, manage the discussion, to pose new issues for an analysis and also to propose referral to suitable literature or other similar information. Lecturers-consultants may also apply an intermediate level of consultations, for example those conducted by students of higher levels, classifying the questions and replying to the simple ones. In the case of greater number of the electronic consultations' participants, the lecturer may divide them into subgroups.

In every stage of the e-consultations, the students, the lecturer as well as the operator/consultant are informed by the system on the actual status of a question, i.e. does it remain without a reply, or was a reply sent, together with other information, such as hour/date of receiving, opening or cancelling the question/answer. Besides, the system gives a possibility of monitoring the number of students availing of the consultations in a split to individual subjects and specialists, and permits an analysis of the students' scope of interest in the consultations.

Consequent stage of the method of distance learning according to the invention is a test work **23** (Fig.3), of which the subject and date of returning are available in the university's web site, advantageously already after the first electronic workshops **21** of a given module **M**. If necessary, a student may collect the test work subject directly at the university. The subject of a test work **23** requires that a student conducts an individual research and analysis of various issues or questions. Ready test work **23** should be returned to the university in a specified time, by means of e-mail and/or fax, regular mail or personal delivery. In the case of sending the test work by e-mail, the student obtains a receipt confirmation immediately. In a predetermined delay from the day of the test work



submission, for example within 7-21 days, advantageously – 14 days, the student receives from the lecturer an information upon the grading, with a commentary. Should the commentary be insufficient, the student may ask for further explanation by e-mail. Final grading for the test work are also available in the university's web site, preferably separately for each password/identification number, as well as traditionally at the university. In the web site are advantageously included general remarks, concerning the test work solutions by students, particularly most frequent errors and their discussion. Rating system may be arbitrary, advantageous, however, is a point system, for example in a 0-100 scale. Exceeding a minimum threshold of points is equivalent with admitting a student to an exam of a given module **M**.

Before approaching the examination **25** (Fig.3), students have an occasion to participate in traditional interactive reviews **24a** run in the university or other places, indicated by the university, or in electronic reviews **24**, within the reviews a look back together with a lecturer of a material covered within a given module **M** takes place. The electronic reviews **24**, active before each examination **25**, permit the students to remind and sort-out the material covered, discussion of the principal issues relating to the given module **M** as well as clearing up all doubts. Terms of traditional reviews **24a** and electronic reviews **24** are available on the university's web site. Electronic reviews take place similarly to the parts **A**, **B2**, **B4** of the electronic workshops **21** with full participations of the lecturer.

Before entering the examination **25** a student should register himself to an examination list. Only such a student may, however, register which has previously successfully completed the test work on a given module. All the information concerning the examination **25** within a given module **M**, such as terms and times, is available on the university's web site and – traditionally – at the faculty office. In the case if a student does not register for an exam or does not pass it, he is entitled to one or several additional terms. Registering to an examination list, which is uniform and dynamic, may be effected both in the electronic way, through a connection with the university's web site, entering the password and selecting a date and time for the exam, as - traditionally. The examination list is closed a few days before the examination **25**.

The last stage of the distance learning by the method according to the invention within one module **M** is the examination **25** to which are allowed the students with successfully completed test work **23** and registered to the examination list. The examination list takes place mostly in a traditional way in one of the university's centers. Examination **25** of individual modules are organized at the same time and places for all students of the university, regardless to the study mode chosen by them, since the study programs and examination requirements are identical for all of them. Exams are in essay form, permitting verification of the assimilation level of the whole material in a given module (subject), while the mode of conducting them is determined by regulations. In exceptional, justified cases the exam may be performed electronically, on-line. In the latter case the examination **25a** is conducted after previous connecting with the educational platform **3**, similarly to the procedure of electronic workshops **21** described above, with such a difference, however, that at least some, and preferably all the accessory tools are disabled, which increases a chance that the student is working without outside assistance. Additional control over the students, writing the examination **25a** by electronic means is its application, depending on the case, of such methods and apparatus as to ensure that the student is passing the exam without an assistance, for example by gathering several students in one place under the supervision of the university's envoy, or for instance, inclusion of each student's iris or fingerprint scan into the computer system. The examination **25** and **25a** may have any known form, appropriate for the given subject. For examination **25a** by electronic means, may be also applied a form of test, while the test should be so designed that its result would give a certainty that the knowledge has been properly assimilated. Multiple choice tests, multilevel tests, self-controlling tests with repeating questions, jump tests and others may be applied.

Examination results are available, similarly as in the case of test works **23** both at the university office and at the university's web site. An access to the examination results is obtained after entering the access password **35** and/or identification number.

The distance learning method according to the invention described above to the limits of one module, is the same for successive modules within all the

education levels. Number of modules within one level, duration of electronic workshops, repetitories or consultations may vary but the basic system of education remains the same.

The web site of the university, which is integral part of the educational platform 3, has an extended structure, being used not only for information purposes but also for interactive communication with students. The Internet web site of the university includes among others an electronic library, on-line faculty offices and "e-consultations", accessible after entering the access password 35 and/or identification number.

The electronic library includes in particular: a list of Internet addresses or links useful for a given module, various complementary material like press articles, interviews, examples, additional exercises and problems, exemplary test works and examinations from previous years, advantageously with solutions, selected or all bachelor and master degree dissertations and other elaborations, features from the university's bulletins and the lecturers' publications. The electronic library is dynamic, with a possibility of constant extension with new files.